

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

<b>APPLICANTS:</b>	James Dale Jr.
<b>SERIAL NO.:</b>	10/764,494
<b>PUB. NO.:</b> <b>PUB. DATE:</b>	US 2004/0244463 A1 December 9, 2004
<b>EXAMINER:</b>	Not Yet Assigned
<b>Art Unit:</b>	
<b>FILED:</b>	January 27, 2004
<b>FOR:</b>	"Calibration Certification For Wheel Alignment Equipment"

Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

February 7, 2005  
St. Louis, Missouri

*OK to enter*  
*EW*  
*SPRE-TC2800*  
*2/23/05*

**THIRD-PARTY SUBMISSION**  
**IN PUBLISHED APPLICATION**  
**UNDER 37 CFR 1.99(a)**

(Duplicate Copy Served To Applicant's Correspondence Address)

Sir:

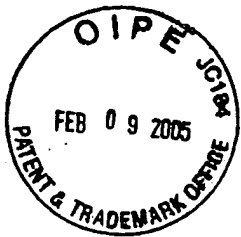
The following information is submitted as relevant to the examination of the above-identified U.S. Patent Application published as U.S. Patent Application Publication No. US 2004/0244463 A1 on December 9, 2004. This submission is submitted within two months of the publication date of the application per 37 CFR 1.99(e), and is accompanied by the fee set forth in 37 CFR 1.17(p), as required by 37 CFR 1.99(b)(1). A duplicate copy of this submission has been served to the applicants' Correspondence Address listed on the face of the U.S.

Patent Application Publication, as required by 37 CFR 1.99(c).

02/10/2005 RFEKADU1 00000023 10764494

01 FC:1806

180.00 0P



IFW

Docket No.: HE B033  
Date: February 7, 2005

In re application of: James Dale Jr.  
Serial No.: 10/764,494  
Filed: January 27, 2004  
Pub. No.: US 2004/0244463A1  
Pub. Date: December 9, 2004  
For: CALIBRATION CERTIFICATION FOR WHEEL ALIGNMENT EQUIPMENT

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is:

- ☒ Third-Party Submission In Published Application Under 37 CFR 1.99(a)  
☒ A check in the amount of \$180.00.

The Commissioner is hereby authorized to charge any additional fees or credit overpayment under 37 CFR 1.16 and 1.17, which may be required by this paper to Deposit Account 162201. *Duplicate copies of this sheet are enclosed.*

Mark E. Books

Mark E. Books  
Registration No: 40,918

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on February 7, 2005.

Mark E. Books

Mark E. Books, Reg. No. 40,918

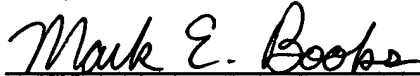
2/7/05

Date

**RELEVANT INFORMATION:**

1. Hunter Engineering Co. Product Literature – Form No. 4346T, "DSP400 Series Sensors", dated March, 2001 (36 pages – **SEE: Pages 1, 6, and 18 Specifically**).
2. Hunter Engineering Co. Product Literature – Form No. 3493T, "Evaluation Of The Performance Of Electronic Wheel Alignment Equipment", dated July, 1997 (20 pages – **SEE: Figures 14 and 16 Specifically**).
3. Hunter Engineering Co. Product Literature – Form No. 1420T, "Operation and Calibration Instructions – Hunter ELECTRON-A-LINE models S7 *et al.*" dated June, 1979 (19 pages).
4. Hunter Engineering Co. Product Literature – Form No. 1415T, "Operation and Calibration Instructions – Hunter ELECTRON-A-LINE models S7M, S7R & S7S" dated June, 1979 (20 pages).

Respectfully submitted,



Mark E. Books, Reg. No. 40,918  
Polster, Lieder, Woodruff & Lucchesi, L.C.  
12412 Powerscourt Drive, Suite 200  
St. Louis, Missouri 63131-3615  
(314) 238-2400  
(314) 238-2401 facsimile

I hereby certify that this correspondence and all attachments is being deposited with the U.S. Postal Service on **February 7, 2005** as first class mail in an envelope addressed to:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

and that in compliance with 37 CFR 1.99(c) and 37 CFR 1.248(a)(4), a second copy of this correspondence and all attachments is being deposited with the U.S. Postal Service on **February 7, 2005** as first class mail in an envelope addressed to:

Mr. Keith E. George  
McDermott, Will & Emery  
600 13<sup>th</sup> Street, N.W.  
Washington, DC 20005-3096

listed as the Correspondence Address for U.S. Patent Application Publication 2004/0244463 A1 corresponding to U.S. Patent Application No. 10/764,494.

Mark E. Books  
Mark E. Books, Reg. No. 40,918  
2/7/05  
Date of Signature

**CALIBRATION INSTRUCTION**

# **DSP400 SERIES SENSORS**

## **With WinAlign<sup>®</sup> Software**

**Models DSP400, DSP400WMS, and DSP400WMH  
require WinAlign<sup>®</sup> 4.1 or later.**

**Models DSP400L, DSP400DT, and DSP400L-DT  
require WinAlign<sup>®</sup> 5.1 or later.**

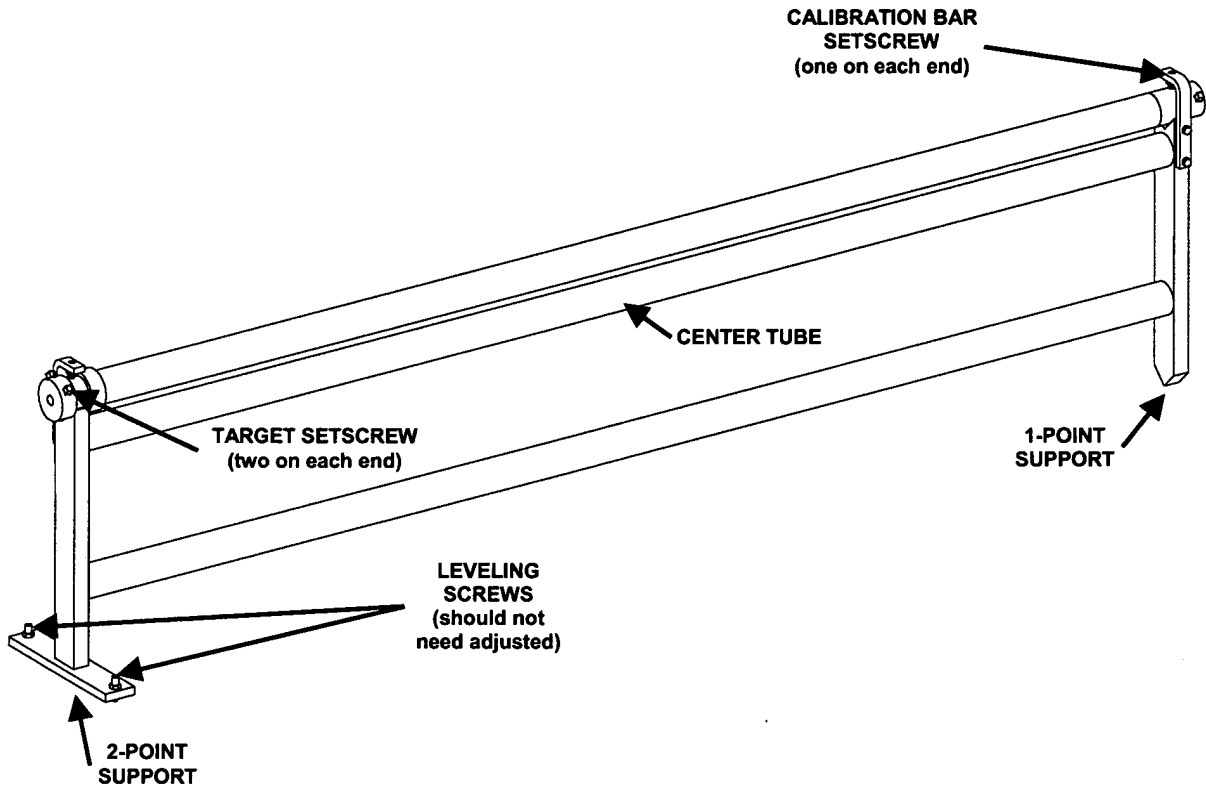
***HUNTER***  
***Engineering Company***

# CONTENTS

<b>1. GENERAL INFORMATION .....</b>	<b>1</b>
1.1 DSP400 Sensors Calibration Fixture .....	1
1.2 Introduction .....	2
1.3 Using Aligner "Softkeys" .....	3
1.4 Calibration Program Basics .....	4
<b>2. SENSOR CALIBRATION .....</b>	<b>5</b>
2.1 Preliminary Procedures.....	5
2.2 Initial Position of Calibration Fixture .....	6
2.3 Install Front Targets .....	6
2.4 Start the Calibration Program .....	7
2.5 Calibration Procedure .....	7
Calibration Phase 1.....	7
Calibration Phase 2.....	12
2.6 Sensor Calibration Check Procedure .....	14
L401, L421, RM, and RL Extended Lift Calibration Bar Positions .....	18
<b>3. DSP400DT SENSOR CALIBRATION .....</b>	<b>19</b>
3.1 Preliminary Procedures.....	19
3.2 Initial Position of Calibration Fixture .....	20
3.3 Install Front Target Adaptor Blocks and Targets .....	20
3.4 Starting the Calibration Procedure.....	22
3.5 Performing the Calibration for DSP400DT.....	23
Calibration Phase 1.....	23
Calibration Phase 2.....	27
3.6 DSP400DT Sensor Calibration Check Procedure .....	29

# 1. GENERAL INFORMATION

## 1.1 DSP400 Sensors Calibration Fixture



The above illustration identifies features of the DSP400 Series Sensors calibration fixture, 72-309-1.

2-point support is consistently positioned on the passenger side during the following calibration procedures (1-point support on driver side).

Calibration bar setscrews (socket head setscrews) keep the bar snug in position. Tightening the setscrew to prevent the bar from turning while installing the targets may be helpful. The bar needs to be able to rotate during calibration.

Target setscrews (square head setscrews) are used to secure targets to bar. Alternately tighten the setscrews with a 3/8-inch open-end wrench until very tight and the target is held securely.

Center tube is the recommended place to grasp when moving fixture.

---

## 1.2 Introduction

To enable the cameras to make accurate target position measurements, they are shipped "Factory" calibrated and must be "Field" calibrated.

"Factory" calibration data for a camera (right or left) is stored in the rear CCD board assembly of that camera. Service representatives cannot perform "Factory" calibration.

"Field" calibration must be completed prior to operation of the DSP400. Field calibration is necessary to establish the 3-dimensional relationship between the left-hand and right-hand cameras and the runways after the cameras have been aimed. Failure to successfully complete the field calibration procedure will inhibit all of the alignment functions of the system.

"Field" calibration data for a pair of cameras is stored in the rear CCD assembly of the left camera. The main PCB in either camera assembly can be replaced without requiring a field calibration.

It is unnecessary to update "Field" calibration data unless the position relationship changes between the camera assemblies and the lift, camera assemblies and the "goalpost", or camera-to-camera.

Complete "Field" re-calibration is required under the following circumstances:

- Either camera assembly has been replaced.
- Cameras have been re-aimed.
- Targets or target faces have been replaced. (New targets)
- Changing alignment height of lift and sensors (excluding DSP400L and DSP400L-DT).
- Damage to the goalpost that changes camera position.

A calibrated set of DSP400 cameras can be used with any 411 or 611, or upgraded 211 alignment console, and WinAlign® 4.1 software or higher.

<b>NOTE:</b> DSP400L, DSP400L-DT, and DSP400DT require WinAlign® 5.1 software or higher.
--






The calibration procedures must be followed carefully. An accurate calibration will not be obtained if the procedures are performed hastily.





DT calibration adaptor block kit, 20-1608-1, is required for proper target orientation when calibrating DSP400DT sensor cameras.

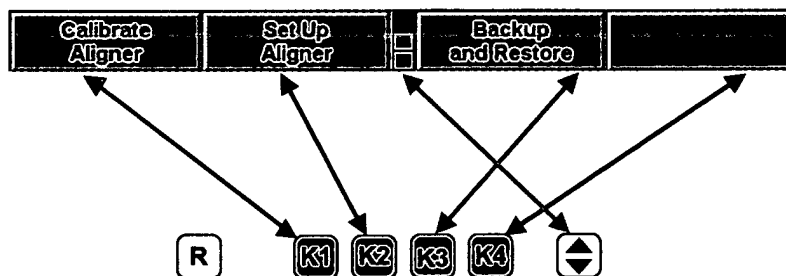




## 1.3 Using Aligner “Softkeys”



The softkeys provide operator control of the program. These keys are identified as:


-  K1 key
-  K2 key
-  K3 key
-  K4 key
-  Menu Shift key
-  Reset key

The four menu labels that appear at the bottom of each screen are referred to as the Softkey Labels. These menu labels indicate the action that the program will take when the corresponding , , , or  key is pressed.



The vertically stacked squares between the  and  menu labels indicate how many levels of menus are available. Up to six levels of menus is possible. The highlighted box indicates the menu level that is currently displayed.

Pressing the Menu Shift softkey, , changes the menu level. When this key is pressed, the menu labels will change to the next level “down.” If the lowest menu level labels are currently displayed, pressing the Menu Shift key will display the first menu level labels. To move to the menu level immediately “up” from the lowest level, press **SHIFT** and .

Throughout this manual, the statement **Press “nnnnnnn”** indicates the label of the softkey to press. If the required label is not displayed on the current menu, press  to change menu levels until the desired label is displayed.

---

## 1.4 Calibration Program Basics


The screen will guide you through the calibration steps.

Pressing "Backup" during the calibration procedure will back up to the previous step. If desired, you may "backup" all the way to the beginning of the calibration procedure.

To illustrate what is desired at each step, the screen will show a "plan view" of the targets mounted on the calibration fixture. When the procedure calls for an operation to be performed on the targets, the graphics on the screen will clearly illustrate what is required.

After you have completed the screen requirements, press the "Ready" softkey. The console will instruct the cameras to save certain measurements. The cameras will wait until they have valid and stable data, and then save it. While the cameras are waiting for the data to stabilize, you will be instructed to wait. Pressing "Pause" will require you to repeat the step.

On some steps of the procedure, the camera software will use the data that has been saved to compute and check a calibration coefficient. If the new coefficient is in error, the screen will show which target has the error, and what the error is, either a procedure error, or an improperly mounted target.

If a calibration error is shown, you have the options of pressing "Backup" and repeating the step, pressing "Continue" and ignoring the error, or, pressing "HELP," then the  key, and then "Sensor Diagnostics," which pops up the sensor diagnostics screen.

The sensor diagnostics screens function exactly as they do for the alignment operating software. If you press "Continue," you will be returned to the step you were on in the calibration procedure when you pressed "Sensor Diagnostics." You may go to the sensor diagnostics screen at any time to view the intermediate results of the calibration procedure or to diagnose a problem.

**NOTE:**

Power must not be removed from the cameras during the calibration procedure. If a camera loses power, it loses the data saved during intermediate steps. The screen will warn you if this happens, and you will have to restart the procedure from the beginning.

## 2. SENSOR CALIBRATION

Use the following calibration instructions for all DSP400 Series Sensors, except for the DSP400DT. For DSP400DT sensor calibration, refer to Chapter "DSP400DT SENSOR CALIBRATION" on page 19.

### 2.1 Preliminary Procedures

Verify that the rack is level and positioned at alignment height.

Verify the alignment rack is resting solid on all four leveling legs or all four ladder stops.

Check hardware for secure mounting. Verify there is no play at camera mounting points, horizontal crossbeam and legs, target shaft mountings, and target mounting screws.

The camera assembly must be installed and aimed in accordance with Installation Instructions of the particular model of DSP400 Sensor.

Form 4345T	Installation Instructions DSP400 Series Sensors
Form 4593T	Installation Instructions DSP400WMS Series Sensors
Form 4595T	Installation Instructions DSP400WMH Series Sensors
Form 4629T	Installation Instructions DSP400L Series Sensors
Form 4630T	Installation Instructions DSP400L-DT Series Sensors

DSP400 camera assemblies will require re-aiming if the position relationship between the sensors and lift has changed.

Once camera aiming has been successfully completed, do **NOT** adjust the camera-viewing angle in any way. Re-tightening a mounting screw can require the system to be re-calibrated.

Verify that all cabling is connected correctly.

Connect the cameras to the aligner console using a short sensor cable, 38-465-1.

<b>NOTE:</b>	For the aligner-to-sensor connection with DSP400 sensors, a short sensor cable, 38-465-1 (5 feet, 3 inches) is recommended. If a longer cable is desired, 38-562-1 (7 feet long) or 38-784-3 (20 feet long) can be used. However, in rare instances, a modified power supply (232-72-1 - contact the Repair Lab to acquire one) may be required to support the longer cable.
--------------	--

Field calibration is performed in two phases. The calibration fixture must be placed on the lift runways as instructed to perform each phase of the calibration procedures. Correct calibration fixture positioning is required for an accurate calibration.

## 2.2 Initial Position of Calibration Fixture

**CAUTION:** The calibration fixture is top heavy. When moving the calibration fixture, grasp the center tube by placing one hand under the tube from the side nearest you, and place the other hand under the center tube from the opposite side. Do NOT lift the fixture by the top tube.

For extended L401, L421, RM, and RL lifts, center the cal bar between the front and rear turnplates. (Refer to the illustration on page 18 for subsequent cal bar positioning during calibration.)

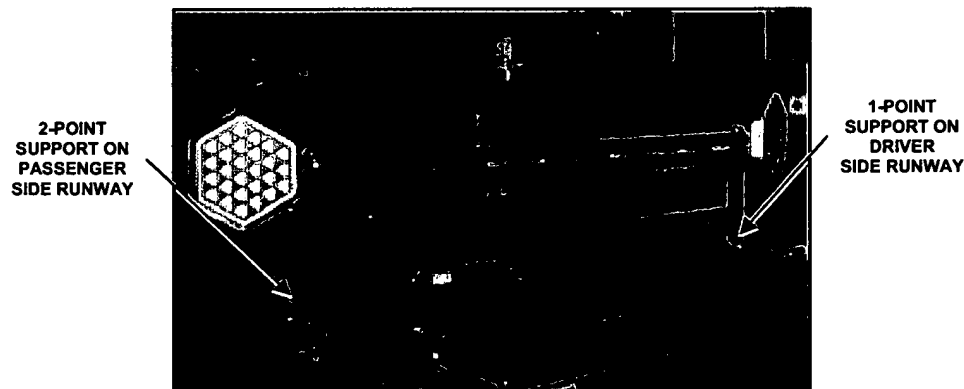
**CAUTION:** DO NOT use the extended lift installation dimensions for any other lift and DSP400 sensor combination installation. On extended lifts, the DSP400 cameras are aimed so that vehicles with less than a 128-inch wheelbase **must** be aligned on the rear turnplate. Only vehicles exceeding a 128-inch wheelbase can be aligned on the front turnplate.

Position the calibration fixture on the lift in the initial calibration position:

- 2-point support on passenger side (1-point support on driver side)
- fixture straight across lift and centered
- 14 inches (356 mm) behind the center of the turnplates.

**CAUTION:** The calibration fixture is almost as wide as the rack. Use care when positioning it so not to push it off the rack.

## 2.3 Install Front Targets



Mount **front targets** (smallest targets) on both ends of the calibration fixture.

Level the targets using the built-in bubble level to direct both targets in exactly the same position. Hand-tighten the square head setscrews.


Alternately tighten the setscrews with a 3/8-inch open-end wrench until very tight and the target is held securely.

**CAUTION:** The targets **MUST** be solidly mounted to prevent any movement. Verify the setscrews are tightened very securely to prevent the targets moving during calibration.

---

## 2.4 Start the Calibration Program

Turn on the system.

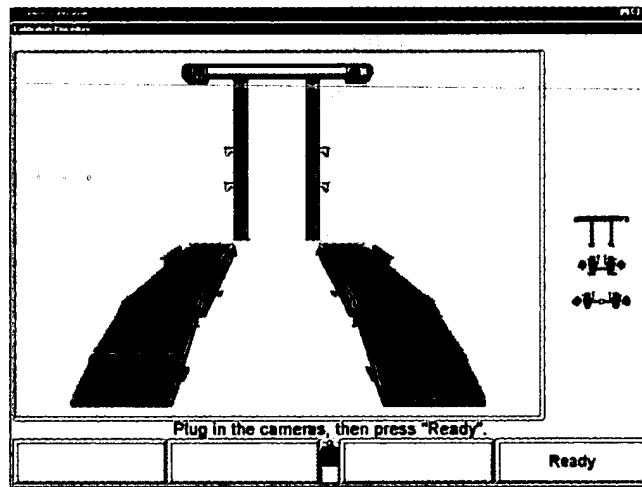
From the logo screen, press the menu shift key, , until the "Service Programs" softkey is displayed.

Press the "Service Programs" softkey.

Press the "Calibrate Aligner" softkey.

Press "Select Sensor Type" and choose the appropriate DSP400 from the list using the arrow softkeys or mouse. Press "OK" softkey to complete sensor selection.

Press "Calibrate Sensors" softkey and then press "Ready" softkey.



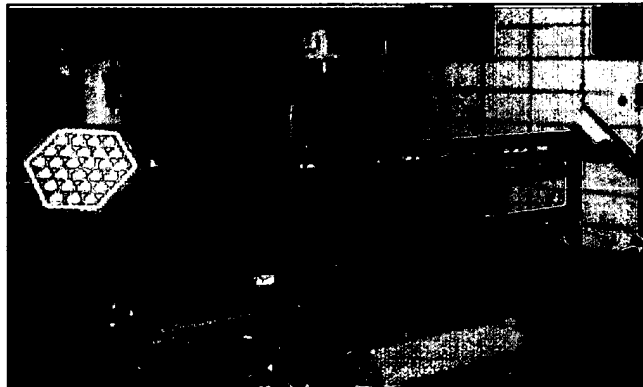
---

## 2.5 Calibration Procedure

Field calibration is performed in two phases. The calibration fixture must be placed on the lift runways as instructed to perform each phase of the calibration procedure. Correct calibration fixture positioning is required for an accurate calibration.

### Calibration Phase 1

Begin with the calibration fixture positioned 14 inches behind the turnplate centers.

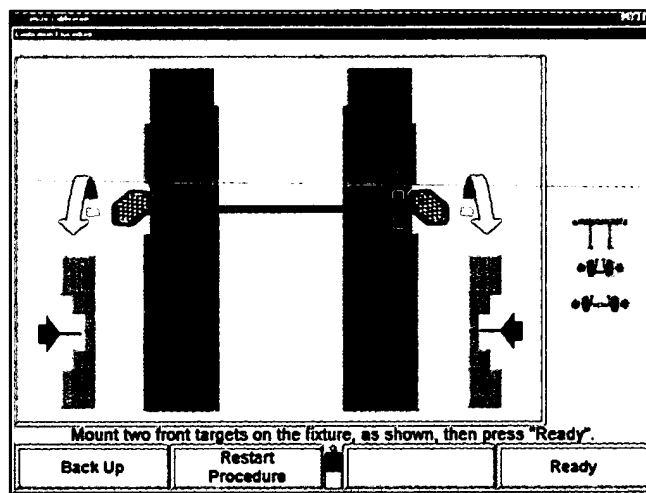


*Refer to page 18 for L401, L421, RM, and RL extended lift cal bar positioning.*

The screen reminds you that two **front targets** must be installed on the calibration fixture.

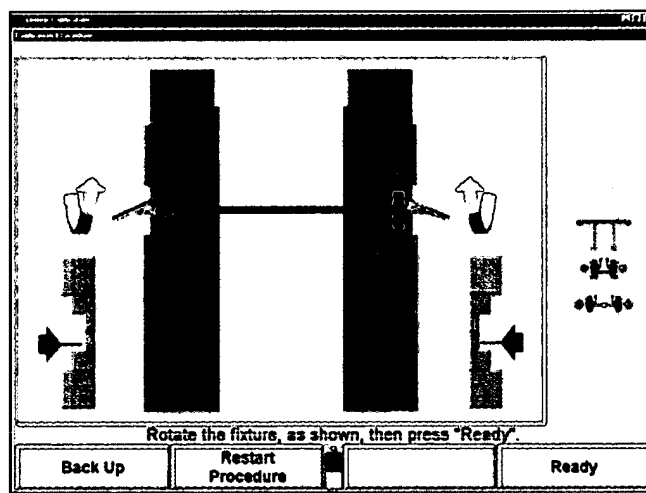
**CAUTION:** It is very important that the targets be mounted securely and not be bumped during any step of the calibration procedure. Accidental target shifting can result in inaccurate calibration measurements and will require re-calibration. Vehicle misalignment will result from inaccurate calibration.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

The screen prompts you to rotate the top of the targets forward until the bar graphs are in the null position and display in green.



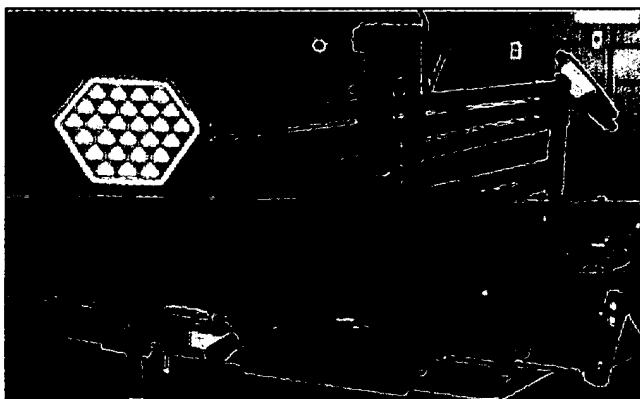
Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

The screen prompts you to move the calibration fixture.

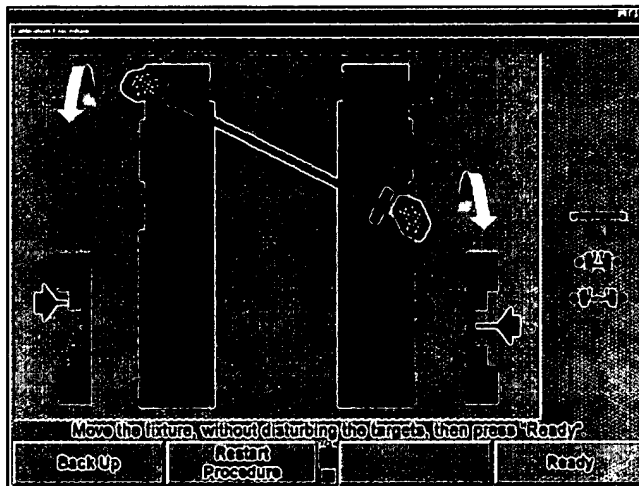
**CAUTION:** The calibration fixture is top heavy. When moving the calibration fixture, grasp the center tube by placing one hand under the tube from the side nearest you, and place the other hand under the center tube from the opposite side. Do NOT lift the fixture by the top tube.

The 1-point support of the calibration fixture should be just in front of the left turnplate pocket and the 2-point support should be just behind the right turnplate.



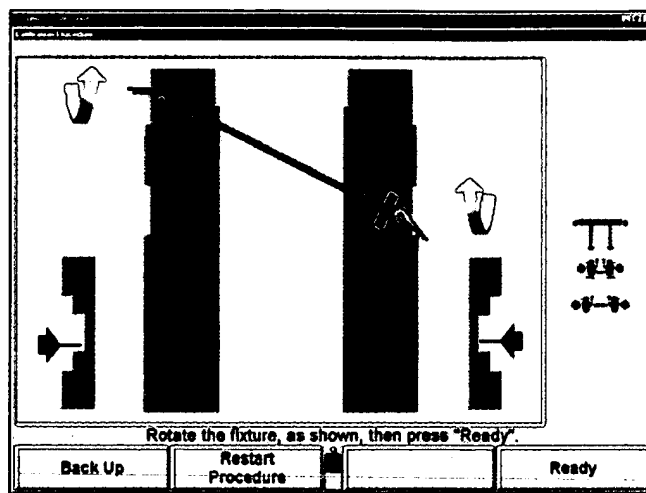
Refer to page 18 for L401, L421, RM, and RL extended lift cal bar positioning.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

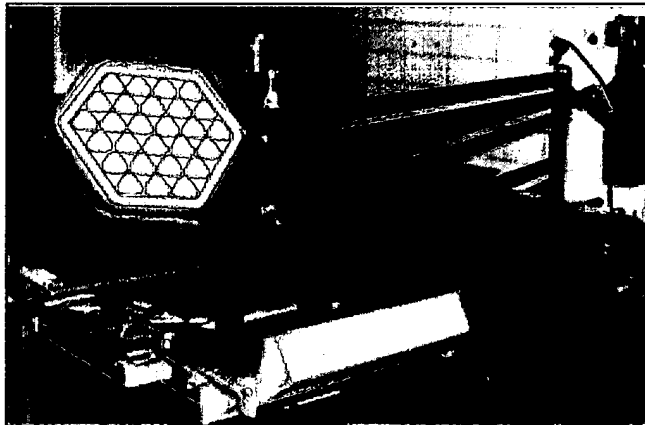
The screen prompts you to rotate the top of the targets forward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

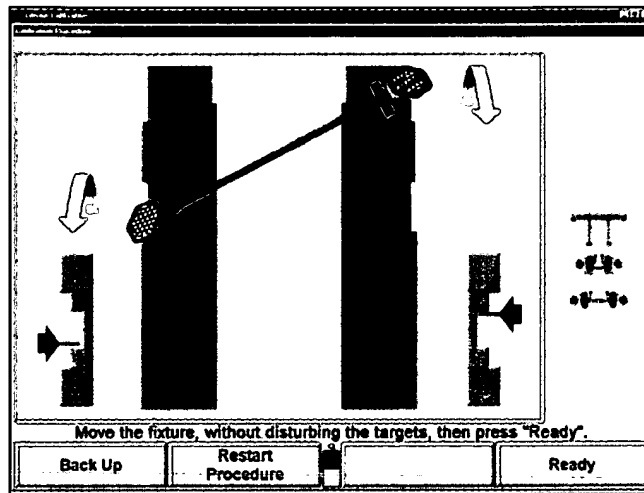
The screen prompts you to move the calibration fixture. The 1-point support of the calibration fixture should be just behind the left turnplate and the 2-point support should be just in front of the right turnplate.



*Refer to page 18 for L401, L421, RM, and RL extended lift cal bar positioning.*

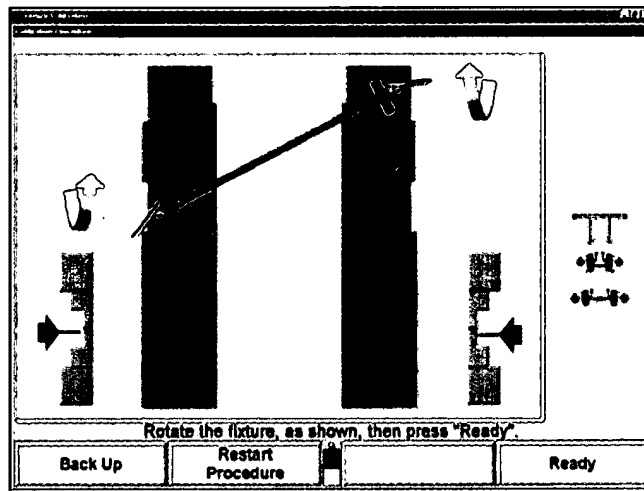


Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Rotate the top of the targets forward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

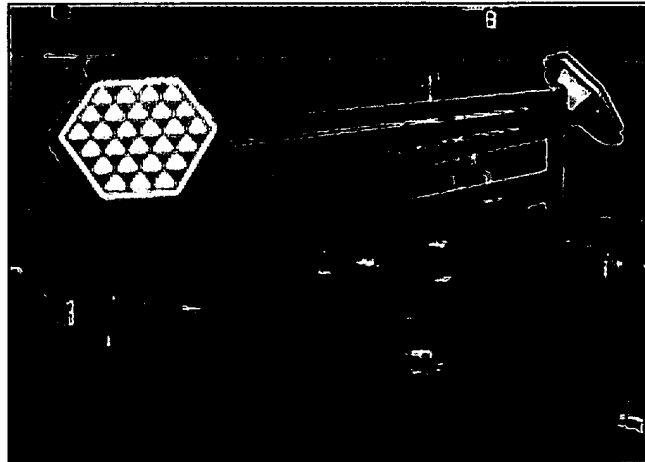
At this point, the cameras compute part of the calibration, which may require as long as 12 seconds.

## Calibration Phase 2

Remove the targets prior to repositioning the calibration fixture. The calibration fixture weighs considerably less without the targets mounted.

**⚠ CAUTION:** The calibration fixture is top heavy. When moving the calibration fixture, grasp the center tube by placing one hand under the tube from the side nearest you, and place the other hand under the center tube from the opposite side. Do NOT lift the fixture by the top tube.

Move the calibration fixture 120 inches behind the center of the turnplates to approximately the center of the rear slip plates. The 1-point support remains on the driver side runway with the fixture straight across lift and centered.



Refer to page 18 for L401, L421, RM, and RL extended lift cal bar positioning.

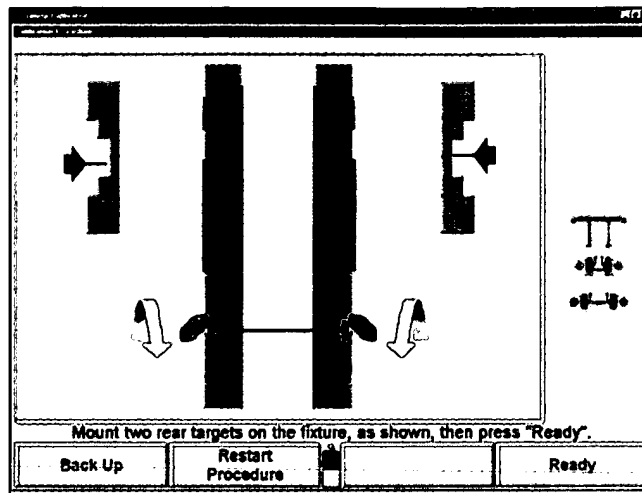
Mount two **rear targets** (larger targets) on the calibration fixture on both ends.

Level the targets using the built-in bubble level to direct both targets in exactly the same position. Hand-tighten the square head setscrews.

Alternately tighten the setscrews with a 3/8-inch open-end wrench until very tight and the target is held securely.

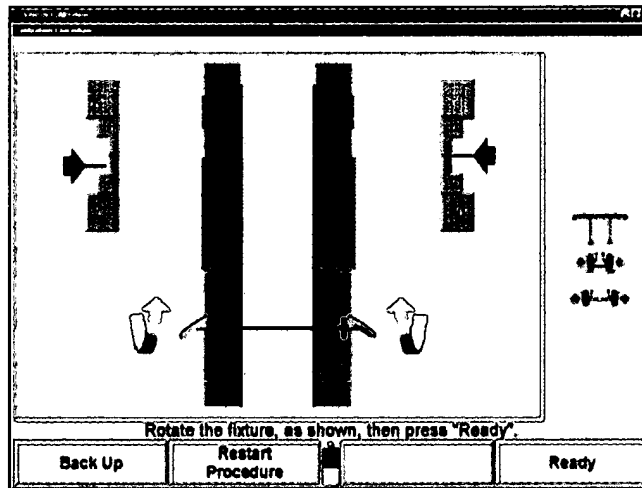
**⚠ CAUTION:** The targets **MUST** be solidly mounted to prevent any movement. Verify the setscrews are tightened very securely to prevent the targets moving during calibration.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



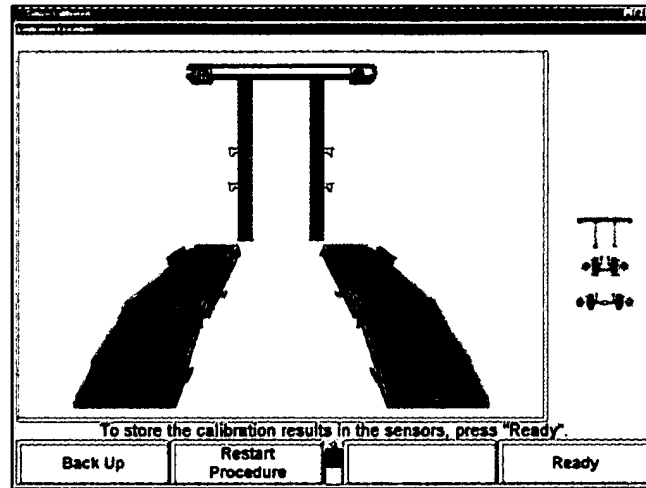
Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Rotate the top of the targets forward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

The screen prompts you to press "Ready" to store calibration results.

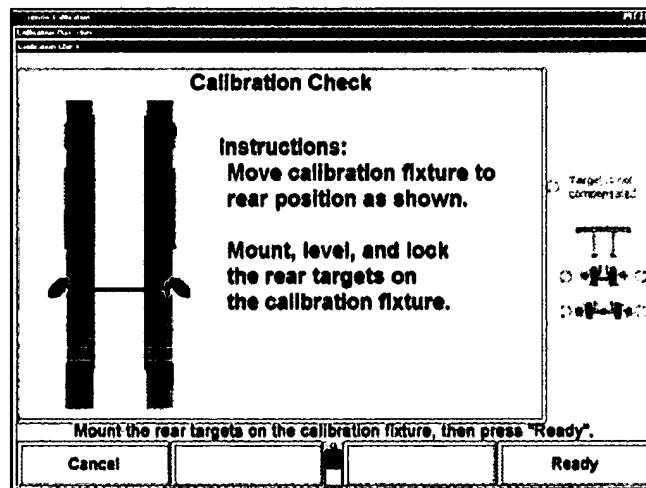


The program will pause while the new calibration data is stored in the cameras. The previous calibration data is deleted.

## 2.6 Sensor Calibration Check Procedure

After calibrating the Sensors, the following screen appears instructing you to position the calibration bar at the rear of the lift, and to mount, level, and lock the rear targets on the calibration bar (same as during calibration).

For extended L401, L421, RM, and RL lifts, refer to the illustration on page 18 for subsequent cal bar positioning during calibration check procedure.



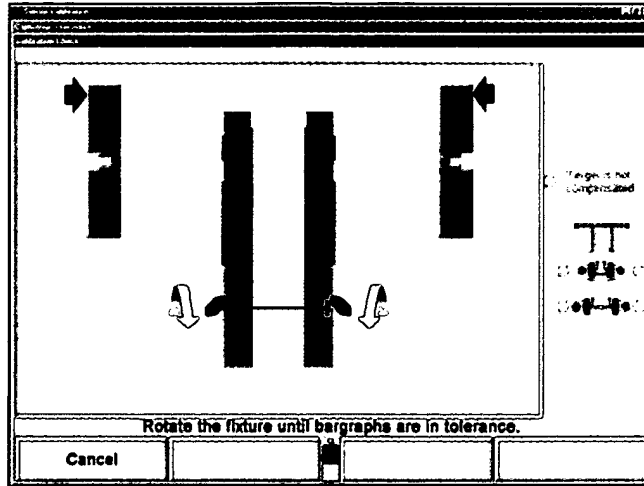
If you choose to not check the calibration now, this procedure can be performed any time during the alignment procedure if sensor measurements are questionable.

To check calibration later, the aligner must be reset then go to "Service Programs", "Calibrate Aligner", and press "Check Calibration" to begin the procedure.

The screen above will appear.

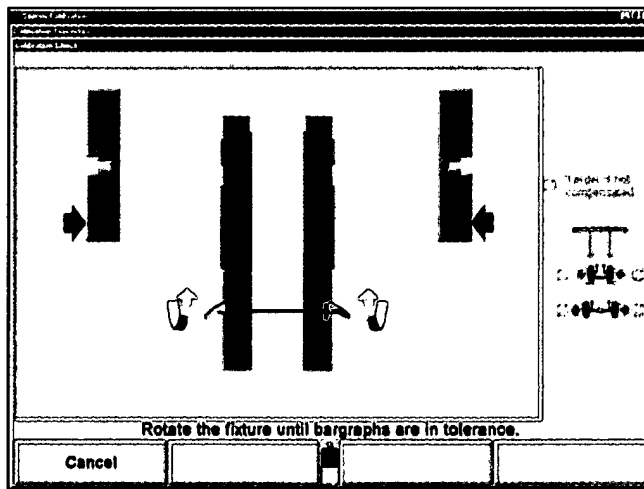
Press "Ready" when you are ready to begin.

Rotate the targets as instructed on the screen.

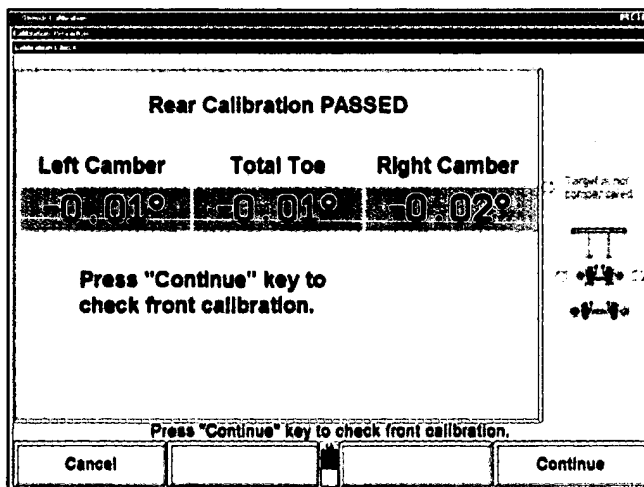


When the readings are stable, the cameras will capture the data and the procedure will advance to the following screen.

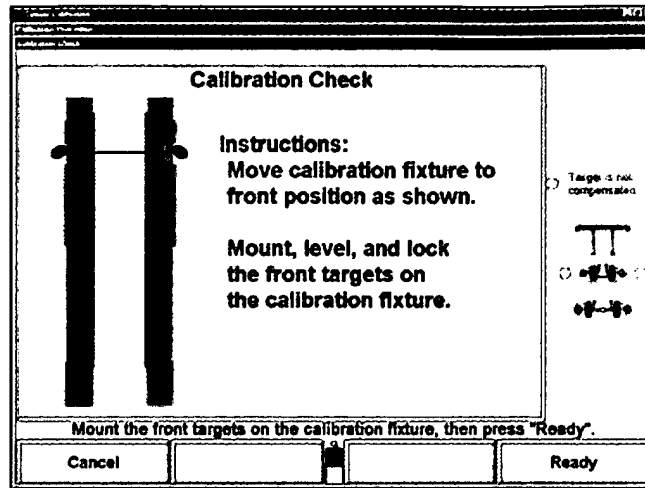
Follow the instructions and rotate the targets as directed.



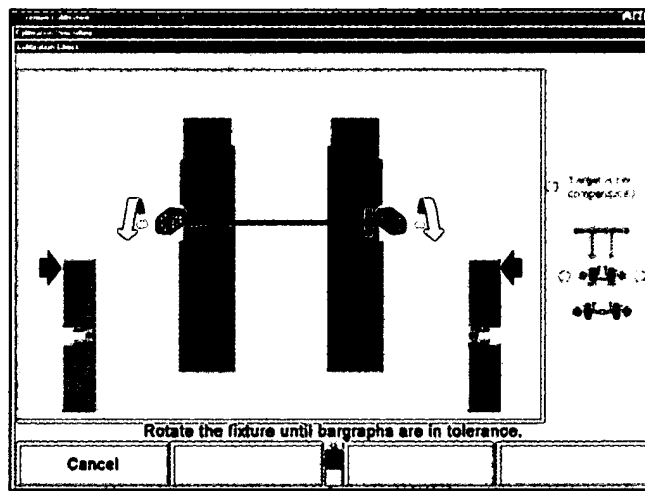
If rear calibration passes, the "Passed" screen appears as below.



Press "Continue" and follow the instructions shown on the screen below.

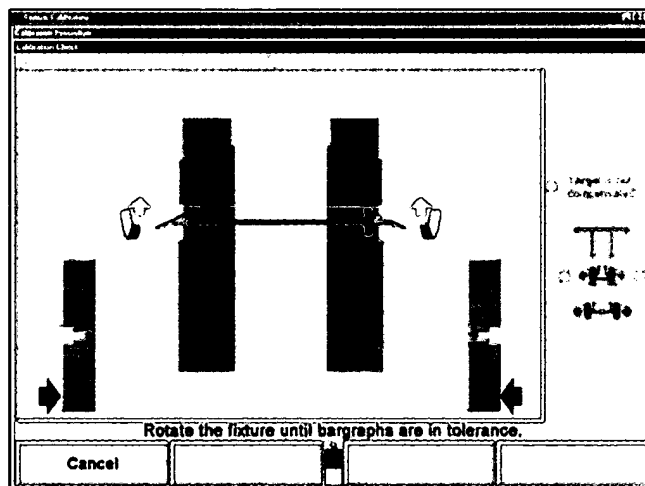


Remove the rear targets and move the calibration bar to the front position. Mount the front targets as directed (same as during calibration). Press "Ready."



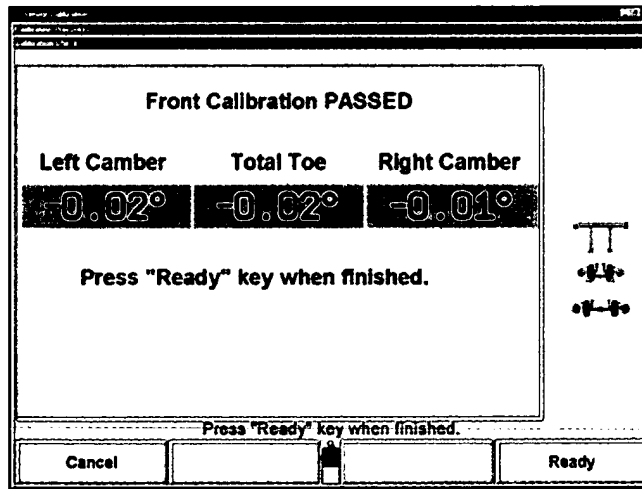
When the readings are stable, the cameras will capture the data and the procedure will advance to the next screen.

Follow the instructions and rotate the targets as directed.

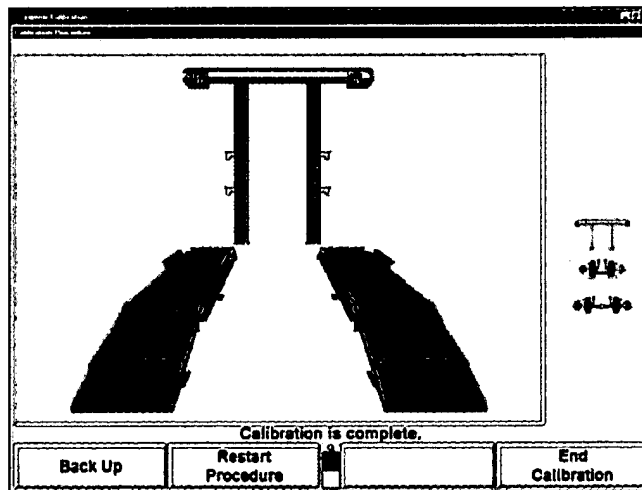


When the readings are stable, the cameras will capture the data and the procedure will advance to the next screen.

If front calibration passes, the "Passed" screen appears as below.



Press "Ready" as instructed and you will be returned to calibration checking entry screen. Press the "Menu Shift" key to present the next level of softkeys. Press "End Calibration" and restart the alignment procedure.



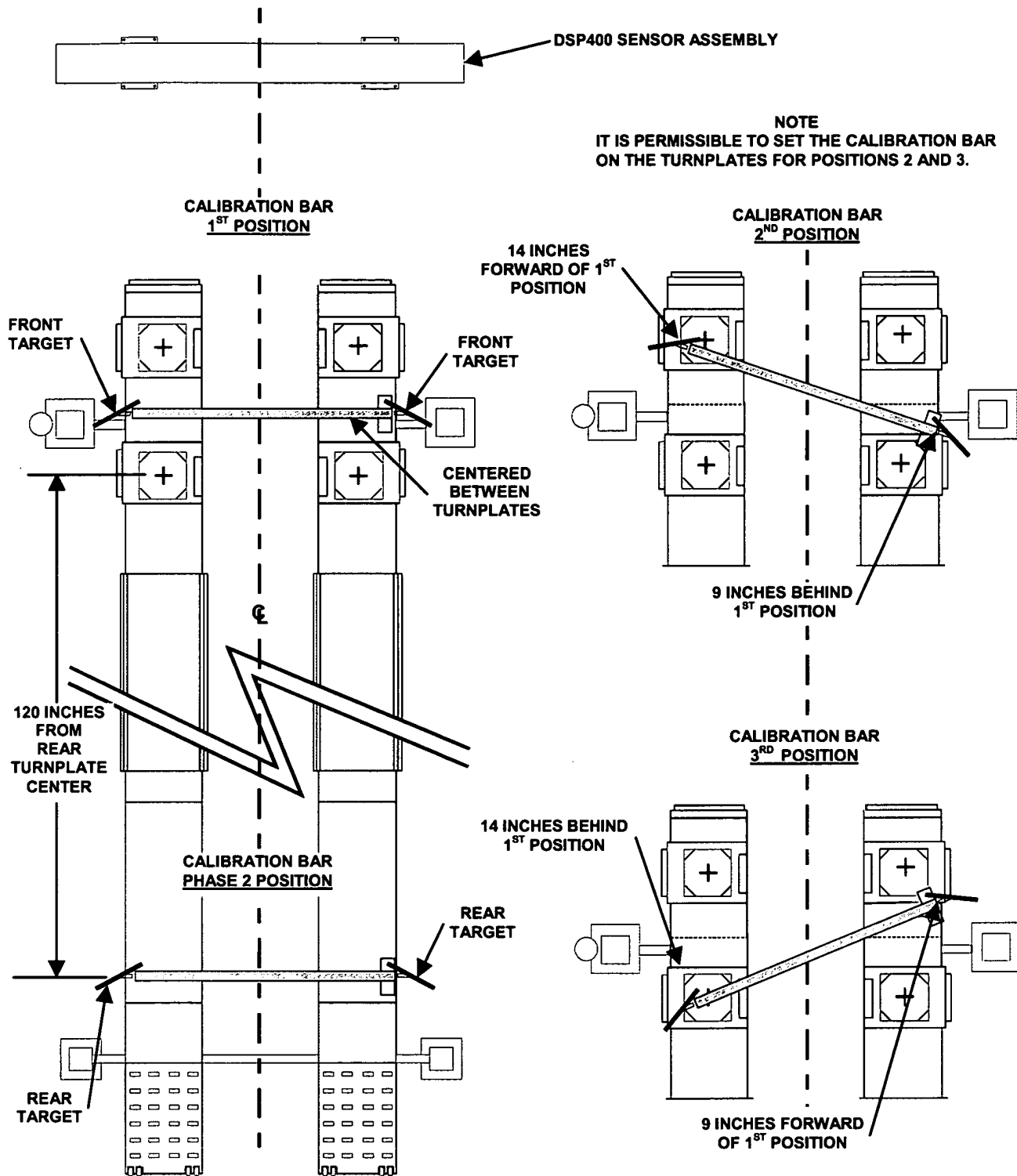
The calibration procedure is complete. Press "End Calibration." This returns you to the main calibration screen. Press "End Calibration" again to return to the reset screen.

When the calibration process is complete, do the following:

- Carefully remove the targets from the calibration fixture and remount them on the wheel adaptors.

- Remove the calibration fixture from the rack runway and store in a dry location.

## L401, L421, RM, and RL Extended Lift Calibration Bar Positions



The illustration above applies to L401, L421, RM, and RL extended lifts **ONLY**.



# 3. DSP400DT SENSOR CALIBRATION

---

## 3.1 Preliminary Procedures

Check hardware for secure mounting. Verify there is no play at camera mounting points, horizontal crossbeam and legs, target shaft mountings, and target mounting screws.

The camera assembly must be installed and aimed in accordance with Form 4625T, Installation Instructions DSP400DT Series Sensors Installation.

DSP400 camera assemblies will require re-aiming if the position relationship between the sensors and lift has changed.

Once camera aiming has been successfully completed, do **NOT** adjust the camera viewing angle in any way. Re-tightening a mounting screw can require the system to be re-calibrated.

Verify that all cabling is connected correctly.

Connect the cameras to the aligner console using a short sensor cable, 38-465-1.

<b>NOTE:</b>	For the aligner-to-sensor connection with DSP400 sensors, a short sensor cable, 38-465-1 (5 feet, 3 inches) is recommended. If a longer cable is desired, 38-562-1 (7 feet long) or 38-784-3 (20 feet long) can be used. However, in rare instances, a modified power supply (232-72-1 - contact the Repair Lab to acquire one) may be required to support the longer cable.
--------------	--

Field calibration is performed in two phases. The calibration fixture must be placed on the lift runways as instructed to perform each phase of the calibration procedures. Correct calibration fixture positioning is required for an accurate calibration.


---

### 3.2 Initial Position of Calibration Fixture

Center the turnplates with a distance of 84 inches measured between outside edges. This distance centers the calibration bar as calibration steps are followed. If 84-inch distance is not possible, center calibration bar in the drive-through lane as needed.

Position the calibration fixture in the drive-through lane (or on the runways over a pit) in the initial calibration position:

- 2-point support on the passenger side (1-point support on the driver side)
- fixture straight across runways and centered
- 14 inches (356 mm) behind the center of the turnplates.

 <b>CAUTION:</b> The calibration fixture is almost as wide as runways installed over a pit. Use care when positioning it so not to push it off.
--

---

### 3.3 Install Front Target Adaptor Blocks and Targets

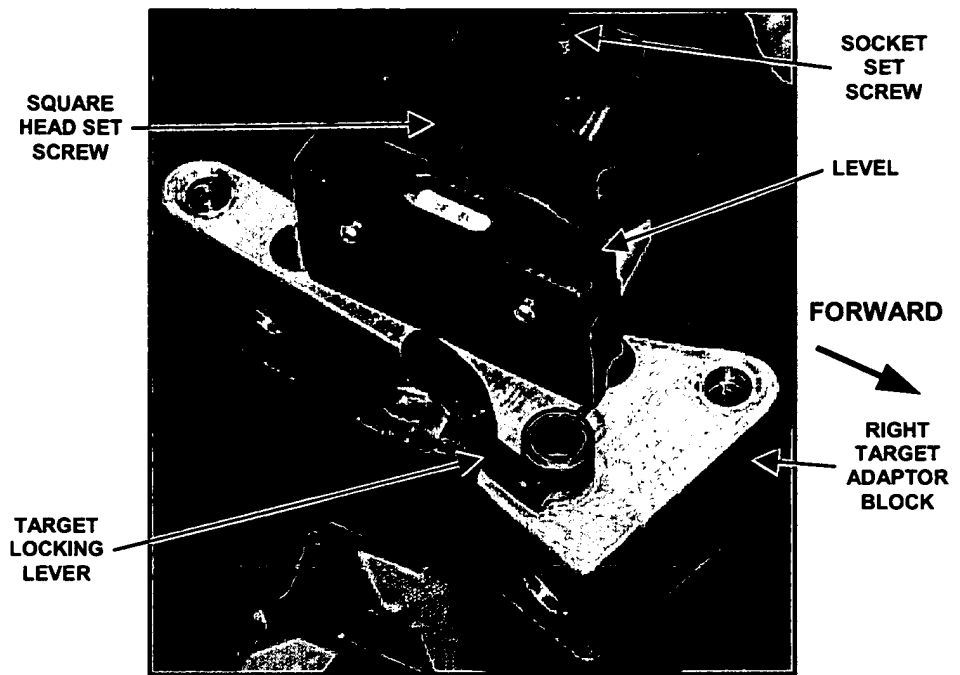
<b>NOTE:</b> Target mounting blocks are used with front targets only.
---

<b>NOTE:</b> DT calibration adaptor block kit, 20-1608-1, is required for proper target orientation when calibrating DSP400DT sensor cameras.
---

Rotate the top tube of the calibration bar so the square head setscrews are positioned on top. Tighten the socket setscrews on each end to prevent the top tube from rotating.

Insert the mounting shaft of the left and right adaptor blocks into the corresponding end of the calibration bar. The target locking lever is oriented to the forward side of the calibration bar as shown in following figure.

Position both adaptor blocks approximately level but only finger-tighten the square head setscrews.



Place a bubble level on one of the adaptor blocks as shown and adjust the adaptor block until the bubble indicates level.

**CAUTION:** Do not move the calibration bar in any way. Doing so may affect the position of the previously leveled adaptor block.

Adjust the left and right sides so that both adaptors are level at the same time.

Alternately tighten the setscrews with a 3/8-inch open-end wrench until they are very tight and the adaptor blocks are held securely.

**CAUTION:** The adaptor blocks **MUST** be solidly mounted to prevent any movement. Verify the setscrews are tightened very securely to prevent the targets moving during calibration.

Mount two **front targets** (smaller targets) on the calibration fixture by inserting the target shaft into the adaptor block on each end. Adaptor blocks should be as level as possible when mounting targets.


Level the targets using the built-in bubble level to direct both targets in exactly the same position. Then rotate the target locking lever to secure each target.

Loosen the socket head screws to allow the top tube of calibration bar to rotate



### 3.4 Starting the Calibration Procedure

Turn on the system.

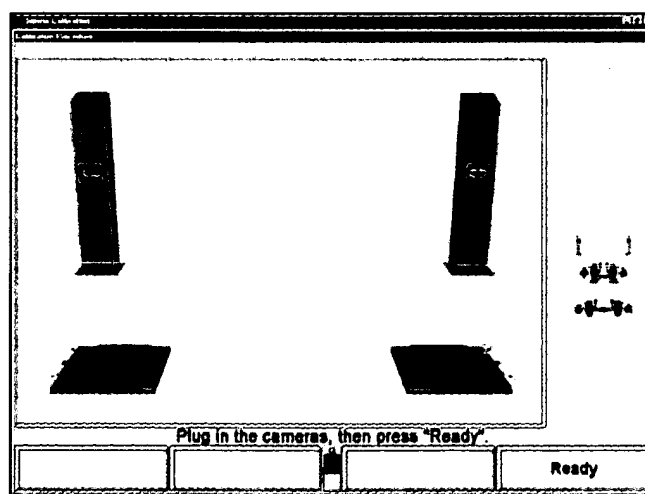
From the logo screen, press the menu shift key, , until the "Service Programs" softkey is displayed.

Press the "Service Programs" softkey.

Press the "Calibrate Aligner" softkey.

Press "Select Sensor Type" and choose DSP400DT from the list using the arrow softkeys or mouse. Press "OK" softkey to complete sensor selection.

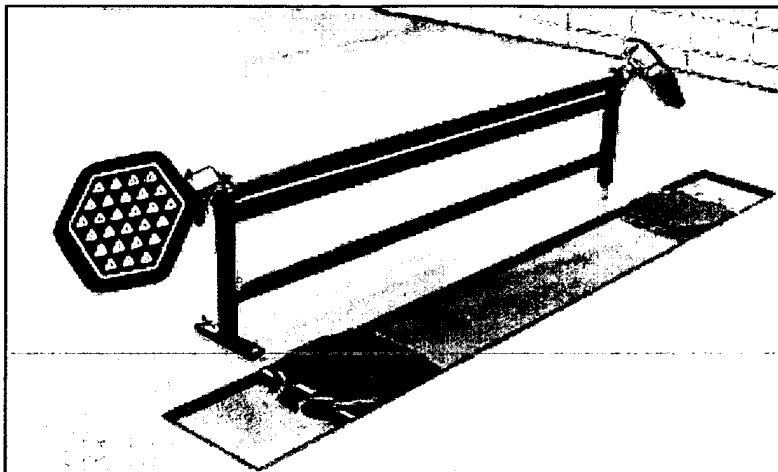
Press "Calibrate Sensors" softkey and then press "Ready" softkey.



### 3.5 Performing the Calibration for DSP400DT

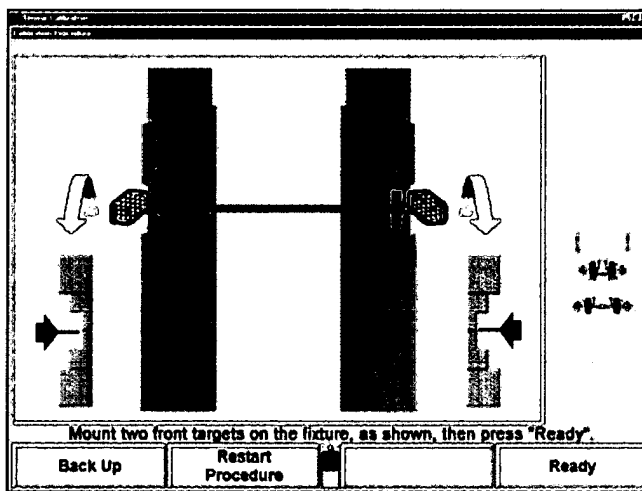
#### Calibration Phase 1

Begin with the calibration fixture, with target adaptors and front targets installed, 14 inches behind the turnplate centers, as shown on the screen.



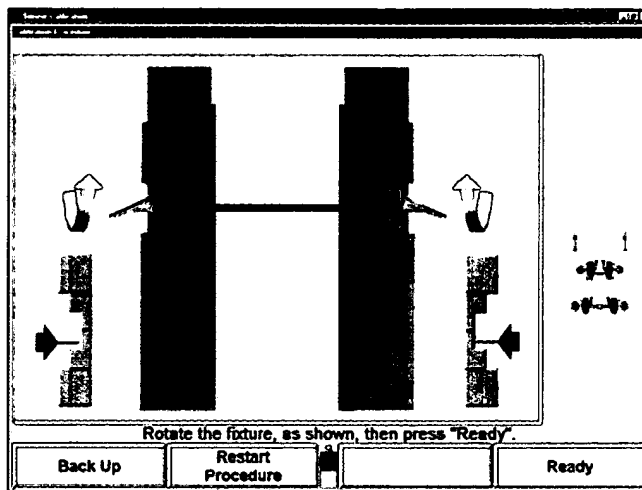
**CAUTION:** It is very important that the targets be mounted securely and not be bumped during any step of the calibration procedure. Accidental target shifting can result in inaccurate calibration measurements and will require re-calibration. Vehicle misalignment will result from inaccurate calibration.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

The screen prompts you to rotate the top of the targets forward until the bar graphs are in the null position and display in green.



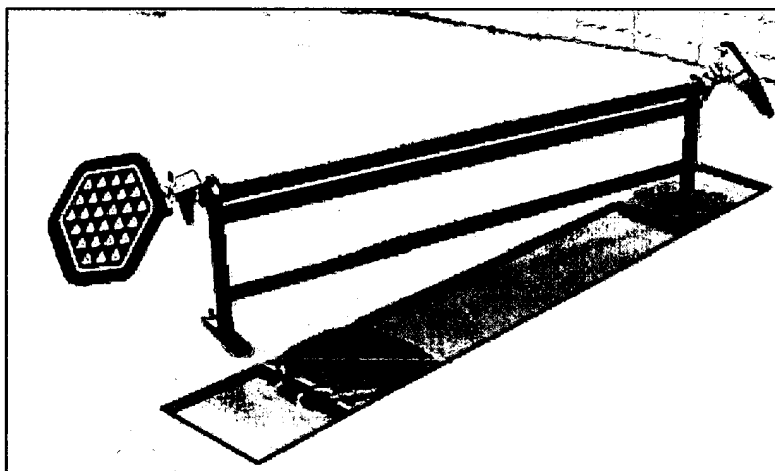
Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

The screen prompts you to move the calibration fixture.

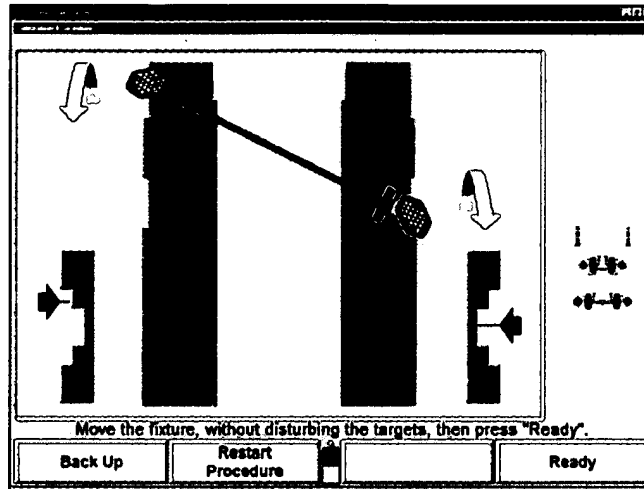
**CAUTION:** The calibration fixture is top heavy. When moving the calibration fixture, grasp the center tube by placing one hand under the tube from the side nearest you, and place the other hand under the center tube from the opposite side. Do NOT lift the fixture by the top tube.

The 1-point support of the calibration fixture should be in the center of the left turnplate and the 2-point support should be 14 inches behind the right turnplate.



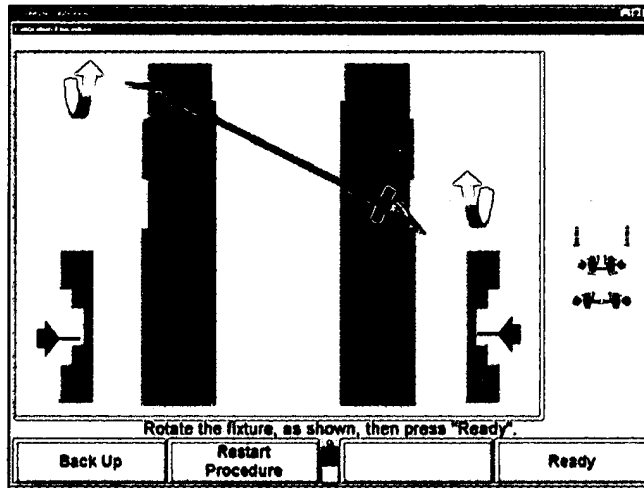
**NOTE:** Even though the image on the screen shows the calibration bar positioned different, locate the calibration bar as specified above.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

The screen prompts you to rotate the top of the targets forward until the bar graphs are in the null position and display in green.

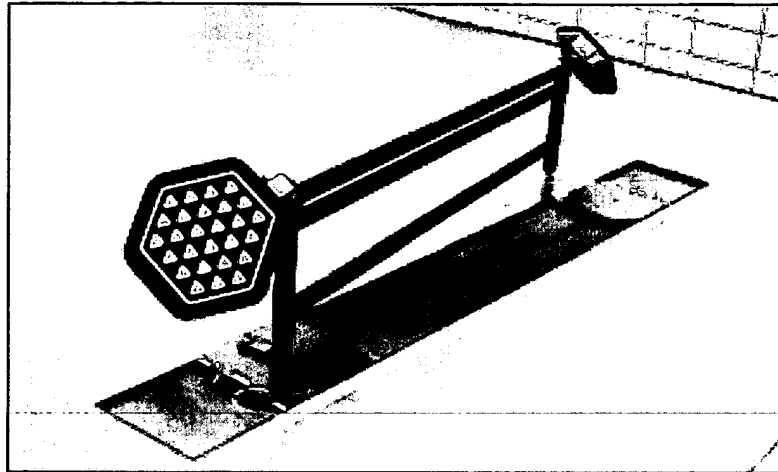


Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

The screen prompts you to reposition the calibration fixture as shown on the screen.

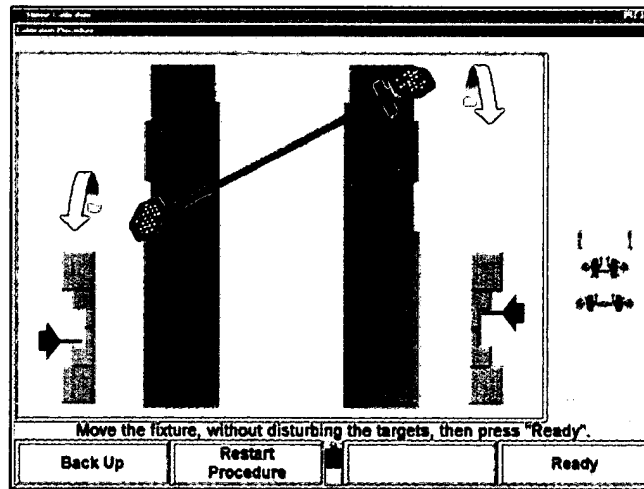
The 1-point support of the calibration fixture should be 14 inches behind the left turnplate center and the 2-point support should be in the center of the right turnplate.



**NOTE:**

Even though the image on the screen shows the calibration bar positioned different, locate the calibration bar as specified above.

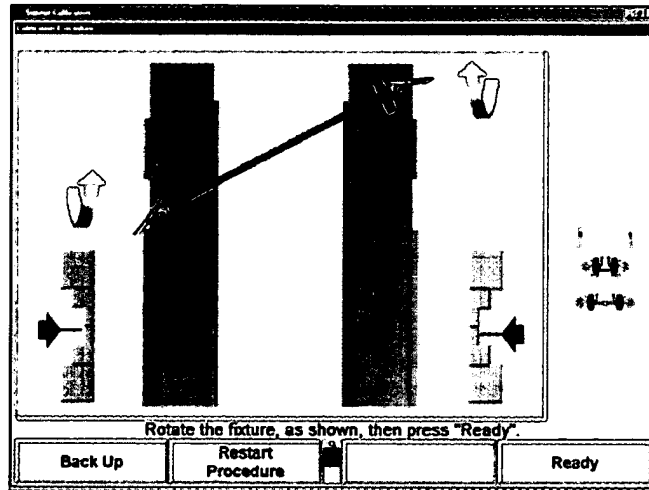
Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.



Rotate the top of the targets forward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Measurements are taken a third and fourth time with the calibration fixture in this location. The screen prompts you to rotate the top of the targets rearward again for measurements and then forward again for measurements.

At this point, the cameras compute part of the calibration, which may require as long as 12 seconds.

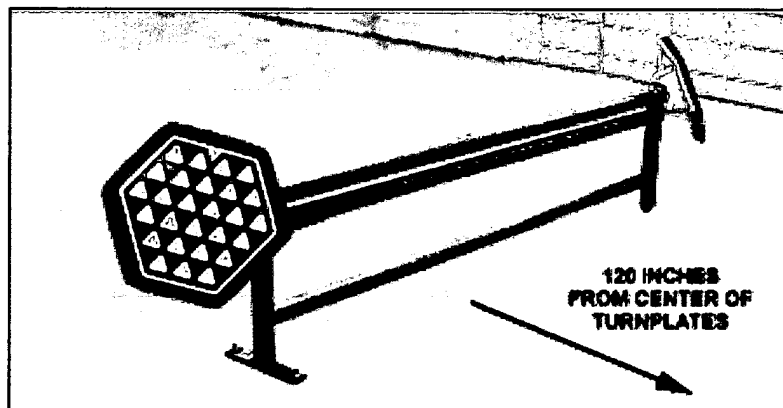
The screen prompts you to reposition the calibration fixture as shown on the screen.

## Calibration Phase 2

Remove the front targets and adaptor blocks prior to repositioning the calibration fixture to the rear position. The calibration fixture weighs considerably less without the targets mounted.

**CAUTION:** The calibration fixture is top heavy. When moving the calibration fixture, grasp the center tube by placing one hand under the tube from the side nearest you, and place the other hand under the center tube from the opposite side. Do NOT lift the fixture by the top tube.

Move the calibration fixture 120 inches behind the turnplates. The 1-point support remains on the driver side runway with the fixture straight across lane and centered.



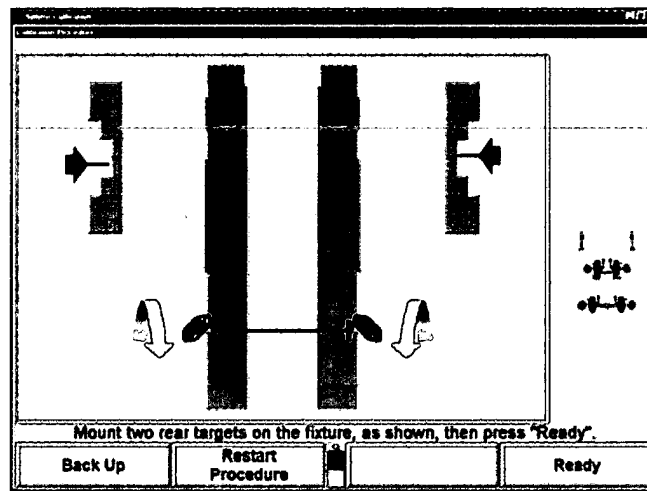
Mount two rear targets (larger targets) on the calibration fixture on both ends.

Level the targets using the built-in bubble level to direct both targets in exactly the same position. Hand-tighten the square head setscrews.

Alternately tighten the setscrews with a 3/8-inch open-end wrench until very tight and the target is held securely.

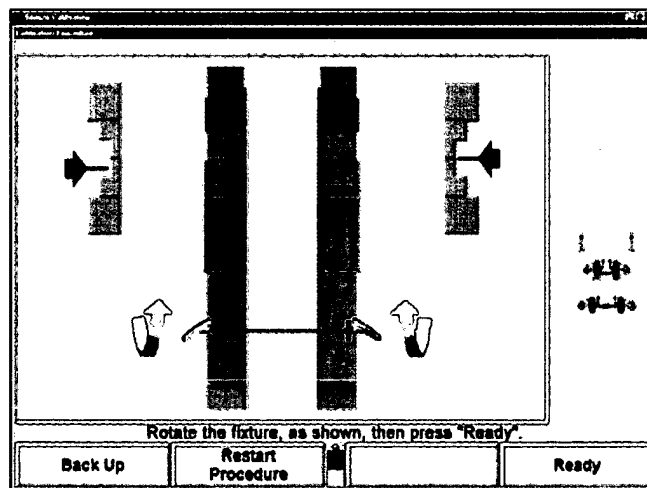
**CAUTION:** The targets **MUST** be solidly mounted to prevent any movement. Verify the setscrews are tightened very securely to prevent the targets moving during calibration.

Rotate the top of the targets rearward until the bar graphs are in the null position and display in green.



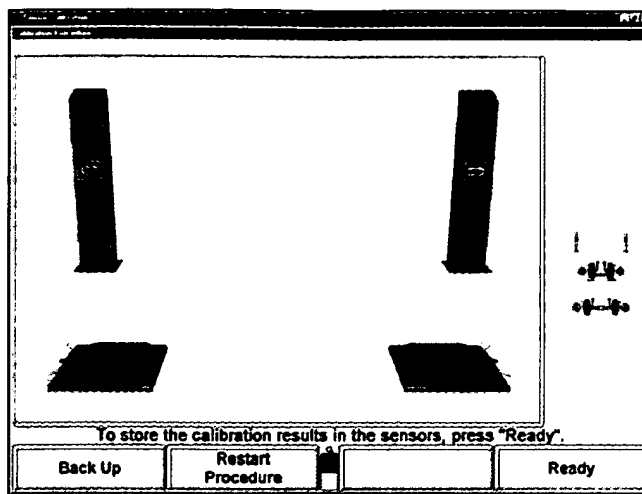
Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

Rotate the top of the targets forward until the bar graphs are in the null position and display in green.



Press "Ready." The screen prompts, "Thank you. Measurements will be saved when the sensors are ready." Wait until this prompt disappears.

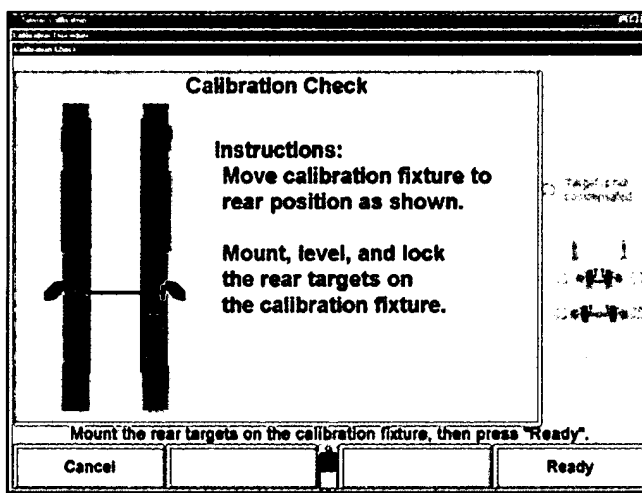
The screen prompts you to press "Ready" to store calibration results.



The program will pause while the new calibration data is stored in the cameras. The previous calibration data is deleted.

### 3.6 DSP400DT Sensor Calibration Check Procedure

After calibrating the Sensors, the following screen appears instructing you to position the calibration bar at the rear of the lift, and to mount, level, and lock the rear targets on the calibration bar (same as during calibration).



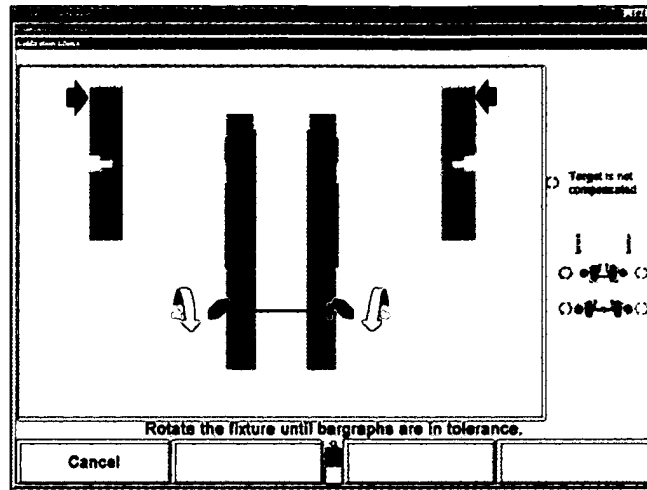
If you choose to not check the calibration now, this procedure can be performed any time during the alignment procedure if sensor measurements are questionable.

To check calibration later, the aligner must be reset then go to "Service Programs," "Calibrate Aligner", and press "Check Calibration" to begin the procedure.

The screen above will appear.

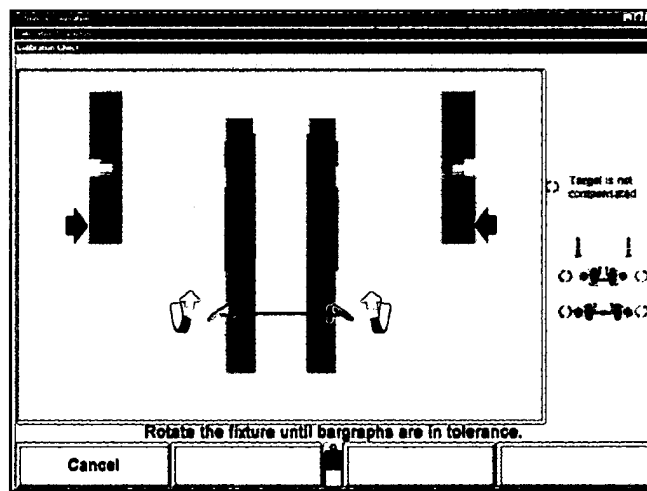
Press "Ready" when you are ready to begin.

Rotate the targets as instructed on the screen.

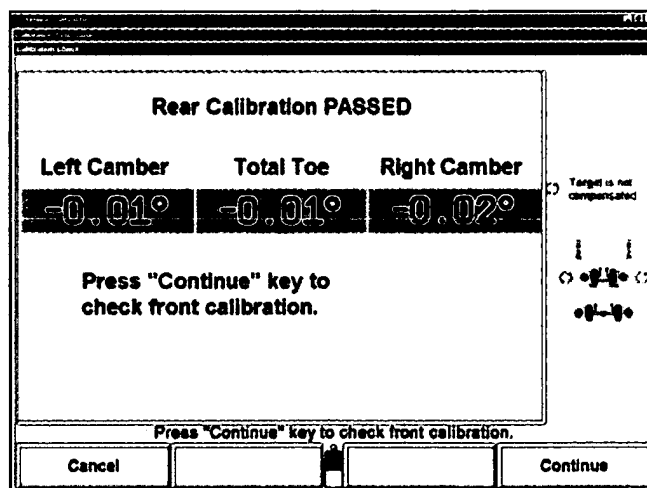


When the readings are stable, the cameras will capture the data and the procedure will advance to the following screen.

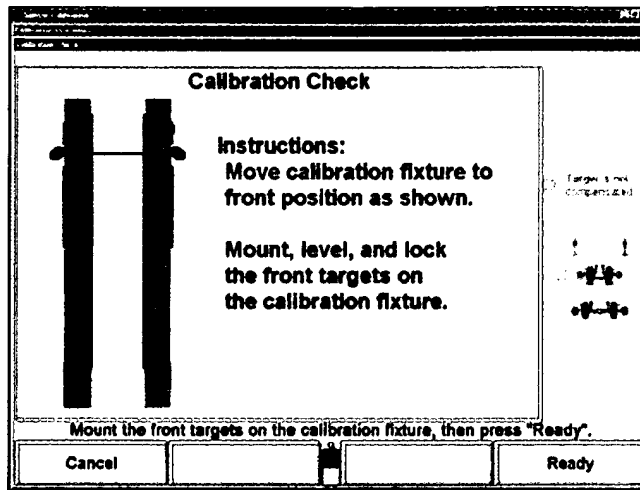
Follow the instructions and rotate the targets as directed.



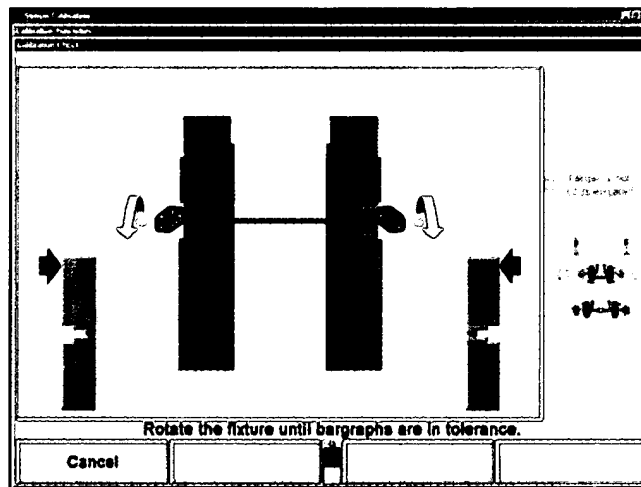
If rear calibration passes, the "Passed" screen appears as below.



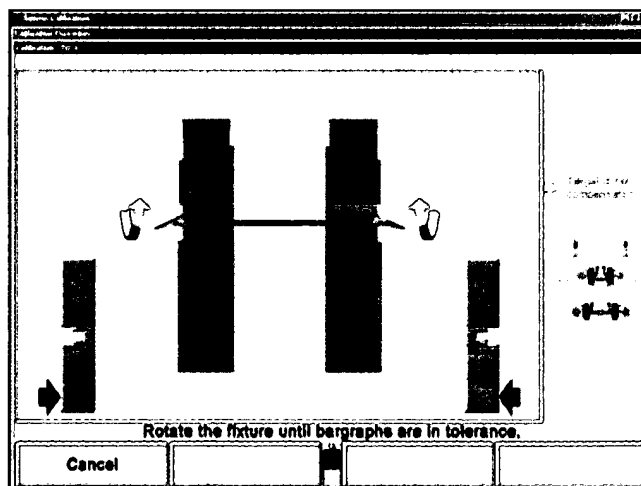
Press "Continue" and follow the instructions shown on the screen below.



Remove the rear targets and move the calibration bar to the front position. Mount the target adaptor blocks and front target. (Refer to section "3.3 Install Front Target Adaptor Blocks and Targets" on page 20.) Press "Ready."

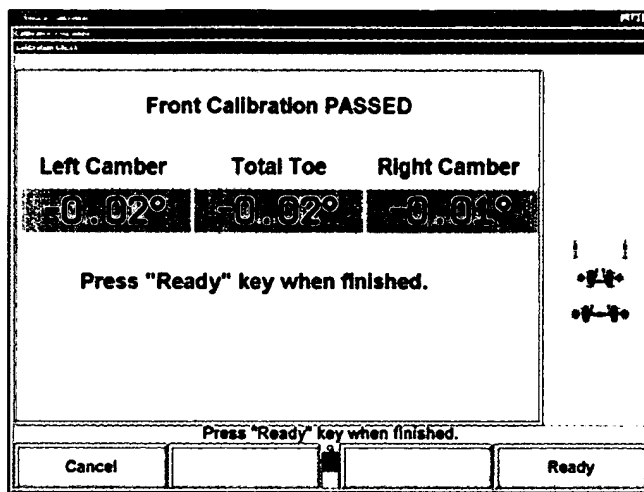


When the readings are stable, the cameras will capture the data and the procedure will advance to the next screen. Follow the instructions and rotate the targets as directed.

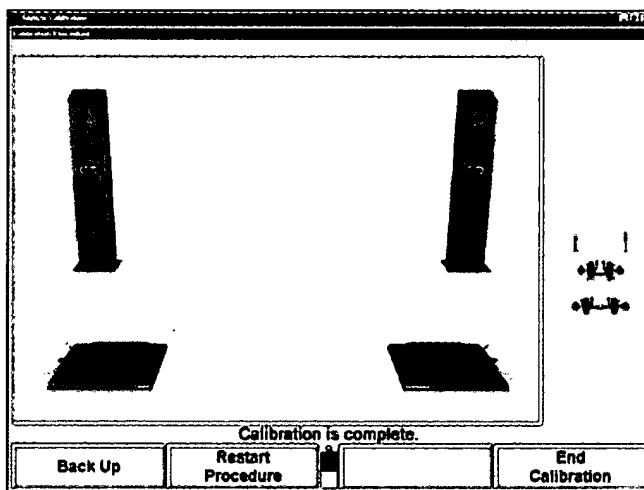


When the readings are stable, the cameras will capture the data and the procedure will advance to the next screen.

If front calibration passes, the "Passed" screen appears as below.



Press "Ready" as instructed and you will be returned to calibration checking entry screen. Press the "Menu Shift" key to present the next level of softkeys. Press "End Calibration" and restart the alignment procedure.



The calibration procedure is complete. Press "End Calibration." This returns you to the main calibration screen. Press "End Calibration" again to return to the reset screen.

When the calibration process is complete, do the following:

- Carefully remove the targets from the calibration fixture and remount them on the wheel adaptors.

- Remove the calibration fixture from the rack runway and store in a dry location.